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ABSTRACT

To investigate operating characteristics of performance factors and the evaluation of potential ratings for new officers, an analysis of controlled effectiveness for 9,230 lieutenant colonels was performed. The study was done to determine whether performance factor variance was so restricted that the performance factors would not provide useful information in the rating process. Also of interest was the extent to which performance factor ratings relate to evaluation of potential ratings and whether any factor could be eliminated from the system due to its insignificant contribution. Results show each of ten performance factors has a mean rating of over 4.4 on a 5-point scale. Over sixty-three percent of the ratings are in the well-above-standard block and twenty-three percent are in the above-standard block. Deletion of no single performance factor from the rating system can be justified because of insufficient variance. Performance factors intercorrelated moderately among themselves. An optimally weighted sum of combined ratings account for forty-five percent of variance in evaluation of potential ratings. No single factor made a significant independent contribution to the prediction level. It appears that raters could provide evaluation of potential ratings of the same quality if one or a small subset of performance factors were deleted from the system. (Author/CSS)

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RELATIONSHIPS AMONG FACTORS IN NEW OFFICER EFFECTIVENESS REPORT SYSTEM

By

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COMPUTATIONAL SCIENCES DIVISION
Brooks Air Force Base, Texas 78235

August 1978
Final Report for Period 15 December 1975 – 30 April 1978

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To investigate the operating characteristics of performance factors and the Evaluation of Potential rating in the new Officer Effectiveness Report system, an analysis of controlled Effectiveness Reports for 9,230 lieutenant colonel ratees was carried out. The purpose of the study was to determine whether the variance of any of the performance factors was so restricted that the performance factor would not provide useful information in the rating process. Additionally, it was of interest to determine to what extent performance factor ratings are related to ratings on Evaluation of Potential and whether any of the performance factors could be eliminated from the system because they do not contribute significantly to the Evaluation of Potential. The results show that each of the 10 performance factors has a mean rating of over 4.4 on a five-point scale. More than 63 percent of all performance

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factor ratings are in the top block, Well Above Standard, and 23 percent in the Above Standard block. The variability on each factor is about equal. The deletion of no single performance factor from the rating system can be justified because of insufficient variance. The performance factors intercorrelated moderately among themselves and with the Evaluation of Potential rating. Taken in combination, an optimally weighted sum of performance factor ratings account for 45 percent of variance in Evaluation of Potential ratings. No single performance factor made a significant independent contribution to this level of prediction. Based on these results, it appears that raters could provide Evaluation of Potential ratings of the same quality if one or a small subset of performance factors were deleted from the system.

PREFACE

This research was completed under Project 6323, Personnel Data Analysis; Task 632304, Analytical Studies of the Personnel System; Work Unit 63230416, Comprehensive Analysis of the New OER System.

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RELATIONSHIPS AMONG FACTORS IN NEW OFFICER EFFECTIVENESS REPORT SYSTEM

I. INTRODUCTION

In 1974, a new Air Force Officer Effectiveness Report (OER) system became operational. A significant change introduced in the system is the controlled distribution of Evaluation of Potential ratings in Block V of AF Form 707. The controlled distribution aspect of the system imposes a limit of 22% of the Block V ratings given by a reviewer in the top block, a limit of 28% in the second block, and the option to distribute the remaining 50% across the bottom four blocks. These controls apply only to reviewers. The first rating official in the chain, the rater, and the second, the additional rater, are not required to conform to the specified distribution in assigning Block V ratings. Another significant departure from the old system is a constraint placed upon the rater in assigning ratings to the 10 Performance Factors in Block III of Form 707. A rating on a Performance Factor may range from Far Below Standard to Well Above Standard. This range is graduated in five steps with Meets Standard at the midpoint. The rater also has the option of using a Not Observed or Not Relevant rating, if appropriate, on a specific factor. If the rater does not use either the Meets Standard or Not Observed block, he must document the rating with a specific example of performance. The 28% limitation on second block ratings of Evaluation of Potential was removed in 1977.

A statistical analysis has been carried out to focus on the individual Performance Factors, Evaluation of Potential ratings, and the interrelationships among these variables. Data used in the study are the ratings contained in 9,230 controlled reports prepared on lieutenant colonel ratees during the window period 30 November 1974 – 31 March 1975. These reports constitute the first controlled report cycle in the new OER system.

II. PERFORMANCE FACTORS

For the purpose of this study, Performance Factor ratings were assigned numerical values from 5 for Well Above Standard to 1 for Far Below Standard. Not Observed/Not Relevant ratings were not converted to this numeric scale. Of the 9,230 reports, 9,149 had complete (numeric) data available on all 10 Performance Factors. The means and standard deviations of ratings assigned by the rater, by the additional rater, and by the reviewer are displayed in Table 1.

Table 1. **Performance Factor Means and Standard Deviations**

	Rater		Additional Rater		Reviewer	
Performance Factor	Mean	SD	Mean	SD	Mean	SD
Job Knowledge	4.67	.60	4.67	.60	4.67	.60
Judgment and Decisions	4.47	.71	4.46	.72	4.46	.72
Plan and Organize Work	4.53	.69	4.52	.69	4.51	.69
Management of Resources	4.52	.70	4.51	.70	4.51	.70
Leadership	4.51	.71	4.50	.72	4.49	.72
Adaptability to Stress	4.49	.73	4.48	.73	4.48	.73
Oral Communication	4.42	.75	4.41	.75	4.41	.75
Written Communication	4.46	.73	4.45	.73	4.45	.73
Professional Qualities	4.61	.67	4.61	.67	4.61	.67
Equal Opportunity Participation	4.42	.80	4.41	.80	4.41	.80

For the entire group of 9,230 reports, the percent of ratings assigned each value by raters is shown in Table 2. Percentages are rounded to the nearest tenth.

It is evident that the predominant factor rating is 5, Well Above Standard, for each of the ten Performance Factors. The Job Knowledge factor is rated Well Above Standard more frequently, 74.1%, than any other factor. Conversely, it is rated Meets Standard less frequently, 6.4%, than any other factor. Oral Communication is rated Well Above Standard by raters less frequently, 57.8%, than any other factor. Equal Opportunity Participation is rated Meets Standard more frequently, 20.0%, than any other factor. The number of Below Standard ratings is insignificant. It varies from one for Equal Opportunity Participation to 20 for the Leadership factor. There is a single rating of Far Below Standard among the 9,230 reports. It is for Professional Qualities. The number of Not Observed ratings ranges from zero for Equal Opportunity Participation to 59 for the Management of Resources factor.

The degree to which separate rating officials in the rating chain agree in the use of Performance Factor ratings is suggested by nearly identical means for the three classes of rating officials on each Performance Factor. This agreement is also indicated by the fact that, of the 9,149 reports for which complete data are available, 93.1% contain a set of Performance Factor ratings assigned by the rater which is identical to ratings assigned by the additional rater. Also, 91.8% of the reports contain identical ratings assigned by the rater and by the reviewer. The additional rater/reviewer agreement is 98.5%.

Correlation coefficients reflecting the relationships between Performance Factors were computed for the 9,149 reports containing complete data. Major results of this correlational analysis are summarized in Table 3. Data are organized separately for ratings assigned by raters, by additional raters, and by reviewers. The table displays the highest and the lowest correlation of each factor with the remaining factors within the ratings assigned by each type of rating official. The median is also reported.

Table 2. **Distribution of Performance Factor Ratings**
(Raters)

Performance Factor	Ratings					
	5	4	3	2	1	Not Observed
Job Knowledge	74.1%	19.4%	6.4%	0.1%	0.0%	0.0%
Judgment and Decisions	59.9%	27.6%	12.4%	0.2%	0.0%	0.0%
Plan and Organize Work	63.7%	25.4%	10.7%	0.2%	0.0%	0.0%
Management of Resources	63.3%	24.5%	11.5%	0.1%	0.0%	0.7%
Leadership	63.3%	24.0%	12.3%	0.2%	0.0%	0.1%
Adaptability to Stress	62.8%	23.3%	13.6%	0.2%	0.0%	0.2%
Oral Communication	57.8%	26.4%	15.7%	0.1%	0.0%	0.0%
Written Communication	60.1%	25.7%	14.0%	0.1%	0.0%	0.1%
Professional Qualities	71.5%	18.3%	10.0%	0.2%	0.0%	0.0%
Equal Opportunity Participation	61.4%	18.6%	20.0%	0.0%	0.0%	0.0%
Total	63.8%	23.3%	12.7%	0.1%	0.0%	0.1%

Table 3. **Performance Factor Intercorrelations**

Performance Factor	Rater			Additional Rater			Reviewer		
	High	Low	Mdn.	High	Low	Mdn.	High	Low	Mdn.
Job Knowledge	.60	.44	.54	.59	.43	.53	.58	.42	.53
Judgment and Decisions	.72	.52	.64	.71	.52	.63	.71	.51	.63
Plan and Organize Work	.66	.51	.62	.64	.51	.61	.64	.50	.61
Management of Resources	.64	.55	.60	.64	.53	.59	.64	.53	.58
Leadership	.72	.53	.64	.71	.52	.63	.71	.52	.63
Adaptability to Stress	.71	.55	.63	.70	.55	.62	.70	.54	.61
Oral Communication	.66	.54	.60	.65	.53	.60	.65	.52	.59
Written Communication	.66	.53	.59	.65	.52	.58	.65	.52	.56
Professional Qualities	.69	.54	.60	.68	.52	.59	.68	.52	.58
Equal Opportunity Participation	.56	.44	.55	.55	.43	.54	.55	.42	.53

All correlations are positive. The correlations among ratings of Performance Factors assigned by raters range from .44 to .72. The medians range from .54 to .64. Inspection of Table 3 indicates that raters' Performance Factor ratings are moderately correlated within all ten Performance Factors and with minor differentiation between factors. The data also indicate a nearly identical range of correlations within the ratings of Performance Factors assigned by additional raters as well as those assigned by reviewers.

The agreement between the use of Performance Factor ratings among the three levels of rating officials is shown in Table 4. The correlation coefficients between each pair of rating officials for the ratings on a given factor are shown.

In general, the correlations are extremely high and indicate that only in rare cases do additional raters override Performance Factor ratings assigned by raters. The correlations between the ratings assigned by additional raters and reviewers are slightly, but systematically, higher than those for raters and additional raters. This indicates the even less frequent override of a factor rating by the reviewer.

Table 4. **Correlation Between Rater Categories**

Performance Factor	Rater/ Additional Rater	Rater/ Reviewer	Additional Rater/ Reviewer
Job Knowledge	.97	.96	.99
Judgment and Decisions	.97	.96	.99
Plan and Organize Work	.97	.96	.99
Management of Resources	.97	.96	.99
Leadership	.96	.96	.99
Adaptability to Stress	.98	.97	.99
Oral Communication	.97	.97	1.00
Written Communication	.97	.97	1.00
Professional Qualities	.97	.97	1.00
Equal Opportunity Participation	.98	.97	.99

III. PERFORMANCE FACTORS AND EVALUATION OF POTENTIAL

In this section the relationships between Performance Factor ratings contained in Block III of the Officer Effectiveness Report and ratings of Evaluation of Potential in Block V of the report will be examined. As background for this discussion, summary statistics for Block V ratings are presented in Table 5. There are six blocks available to rate Evaluation of Potential. The controlled distribution feature of the system imposes a limit of 22% of each reviewer's ratings in the top block and a limit of 50% in the top two blocks. For the purpose of this report, numerical values 1 through 6 have been assigned to top block, second block, . . .sixth block ratings.

Table 5. **Distribution of Ratings of Evaluation of Potential**

Ratings of Evaluation of Potential	Rater	Additional Rater	Reviewer
1	41.5%	27.9%	21.8%
2	33.7%	32.7%	29.0%
3	23.5%	37.8%	47.3%
4	1.2%	1.5%	1.8%
5	0.1%	0.1%	0.1%
6	0.0%	0.0%	0.0%

The controlled distribution target percentages have been closely adhered to across the population of reviewers.

The extent of the relationship between individual Performance Factor ratings assigned by raters and the Evaluation of Potential rating is presented in Table 6. The first column displays the validity of Block III ratings assigned by the rater for the rater's Evaluation of Potential ratings; the second column displays the validity coefficients of the rater's Block III ratings for the additional rater's Evaluation of Potential; and the final column contains the validity coefficients of rater's Block III ratings for the reviewer's Evaluation of Potential.

All validity coefficients are negative, since numerically high ratings on Performance Factors tend to be associated with numerically low ratings on Evaluation of Potential. In displaying validity coefficients in Table 6 and in the discussion which follows, references to these negative correlation coefficients will be omitted, since the negative signs are an artifact of the scaling procedure. Validity coefficients for raters' Evaluation of Potential ratings range from .37 for Equal Opportunity Participation to .60 for Leadership. Except for Equal Opportunity Participation, the validity coefficients are tightly packed in the range .47 to .60. The same pattern of validity coefficients is evident for both additional raters' and reviewers' Evaluations of Potential. However, the magnitude of the validities systematically decreases from the raters' to the additional raters' to the reviewers' Evaluations of Potential. The Leadership factor is the most valid for Evaluations of Potential for each class of rating official. Equal Opportunity Participation is the least valid in

Table 6. **Validity of Rater Performance Factors for Block V Ratings**
(Sign Reversed)

Performance Factor	Rater	Additional Rater	Reviewer
Job Knowledge	.47	.38	.34
Judgment and Decisions	.59	.48	.43
Plan and Organize Work	.54	.45	.40
Management of Resources	.51	.41	.37
Leadership	.60	.50	.45
Adaptability to Stress	.57	.46	.41
Oral Communication	.53	.44	.40
Written Communication	.50	.40	.36
Professional Qualities	.52	.43	.39
Equal Opportunity Participation	.37	.30	.27

each class. Similarly, Judgment and Decisions falls next to Leadership for all three rating officials, and Job Knowledge falls next to Equal Opportunity Participation for all three rating officials.

To examine the extent to which combinations of Performance Factors account for ratings of Evaluation of Potential, several series of multiple regression analyses were performed. Using the raters' Evaluation of Potential as the dependent variable, the squared multiple correlation coefficient, R^2 of the 10 Performance Factors is .4540. This means that an optimally weighted linear combination of Performance Factor ratings assigned by raters can account for 45% of the variability within raters' Evaluation of Potential. The corresponding R^2 values are .3036 and .2438 for additional raters' and reviewers' Evaluations of Potential, respectively, using raters' Performance Factor ratings as independent variables. In the first series of 10 multiple regression problems, each of the 10 Performance Factors was removed. The comparison of the resulting R^2 with the full model R^2 using all 10 Performance Factors as independent variables indicates the extent of the independent contribution of each Performance Factor to the remaining nine Performance Factors. A similar series of 10 regression systems was computed using additional raters' Evaluation of Potential as the dependent variable and deleting one of the 10 raters' Performance Factors in each of the problems. Finally, a third series was carried out using the reviewers' Evaluation of Potential as the dependent variable. A summary of these results is displayed in Table 7.

The Variable Only columns in Table 7 display the squared validity coefficients of the individual Performance Factors. To illustrate how data in Table 7 may be interpreted, the 10 Performance Factors as a group have an R^2 of .4540 for raters' Evaluation of Potential. When considered alone, the Leadership factor has a squared validity coefficient of .3618. When Leadership is removed from the set of 10 Performance Factors, the remaining nine Performance Factors yield an R^2 of .4408. Individual Performance Factors account for between 14% and 36% of the variability in raters' Evaluation of Potential. However, none of the 10 independent contributions is of practical importance. These individual independent contributions range from .0007 for Written Communication (.4540 to .4533) to .0132 for Leadership (.4520 to .4408). A similar pattern emerges when comparable data for additional rater' and reviewers' Evaluations of Potential are examined. Although individual Performance Factors differ somewhat in their predictability of additional raters' and reviewers' Evaluations of Potential, no single Performance Factor makes a substantial independent contribution to the predictability of these two dependent variables.

A distinct decrease in the predictability of the dependent variable is observed between the raters', additional raters', and reviewers' Evaluations of Potential. In order to further ascertain and evaluate the role of raters' Performance Factor ratings in the assignment of reviewer ratings of potential under the limitations of the constraints imposed by the controlled distribution system,

Table 7. **Predictability of Evaluation of Potential**

Performance Factor	Rater		Additional Rater		Reviewer	
	Var. Only	Var. Deleted	Var. Only	Var. Deleted	Var. Only	Var. Deleted
Job Knowledge	.2229	.4529	.1425	.3033	.1145	.2464
Judgement and Decisions	.3506	.4451	.2343	.2971	.1879	.2420
Plan and Organize Work	.2940	.4506	.1995	.3001	.1616	.2439
Management of Resources	.2525	.4523	.1694	.3030	.1385	.2460
Leadership	.3618	.4408	.2450	.2930	.2009	.2373
Adaptability to Stress	.3204	.4492	.2105	.3009	.1670	.2452
Oral Communication	.2831	.4497	.1921	.2996	.1583	.2430
Written Communication	.2459	.4533	.1586	.3034	.1314	.2463
Professional Qualities	.2758	.4524	.1822	.3027	.1513	.2455
Equal Opportunity Participation	.1379	.4487	.0907	.3000	.0750	.2438

additional multiple regression systems were computed. For a model in which the reviewer's Evaluation of Potential was the dependent variable and the independent variables consisted of both the rater's and additional rater's Evaluations of Potential, as well as the 10 Performance Factor ratings assigned by the rater, the R^2 is .7602. When only the ratings of Evaluation of Potential assigned by the rater and by the additional rater are used to predict the reviewer's Evaluation of Potential, R^2 = .7599. It is evident that raters' Performance Factor ratings have virtually no systematic relationship to reviewers' Evaluations of Potential after the Evaluations of Potential assigned by the rater and the additional rater have been taken into account. The validity of the additional raters' Evaluation of Potential for the reviewers' Evaluation of Potential is .87, and the squared validity is .7592. The validity of the raters' Evaluation of Potential is .69, and the squared validity is .4713. While both Evaluation of Potential variables (rater and additional rater) have substantial validities for the reviewers' Evaluations of Potential, and both variables individually account for a larger proportion of the variability in reviewers' Evaluation of Potential than a linear combination of all 10 Performance Factors, it is clear that the additional raters' Evaluation of Potential accounts for substantially all of the predictable variance in the reviewers' Evaluation of Potential. This fact is further substantiated by the agreement between additional raters and reviewers in assigning Evaluation of Potential ratings. On 84.4% of the reports the additional rater and reviewer assigned identical ratings; in 15.1% the reviewer lowered the additional rater's rating (higher numerical value on a scale of 1–6); and in 0.6% the reviewer raised the rating. Corresponding figures for the agreement between reviewers and raters are 60.3%, 38.4%, and 1.3%, respectively.

When the rater's Evaluation of Potential and his ratings of Performance Factors are used in a multiple regression system to account for the additional rater's Evaluations of Potential, R^2 = .5929. As noted previously, the squared multiple correlation coefficient of 10 Performance Factors for the additional rater's Evaluation of Potential is .3036. The validity of the rater's Evaluation of Potential for the additional rater's Evaluation of Potential is .77, and the squared validity is .5903. Although both Performance Factor ratings and rater's Evaluation of Potential account for a substantial proportion of the variability in the additional rater's Evaluation of Potential, the independent contribution attributable to the rater's Evaluation of Potential is considerably larger than that of the Performance Factors.

IV. DISCUSSION

The majority of the Performance Factor ratings on the new Form 707 are high. Mean values for individual factors all exceed 4.4 on a five-point scale. There is virtually no use of the lower half of the scale. Only 0.2%, or fewer, of the reports contained ratings of 2 (Below Standard) on any Performance Factor. The Far Below Standard block was used on only one report for a single factor. Apparently, raters see no particular problem in providing specific examples of Above Standard and Well Above Standard performance, since these blocks are used in 23% and 63% of the ratings, respectively. An analysis of the content of specific examples cited by raters is beyond the scope of the present study. There would seem to be some question as to whether specific examples of Above Standard and Well Above Standard performance cited by raters are of uniform quality.

In general, second- and third-level raters in the rating chain accept ratings of performance provided by the rater. There was complete agreement in Performance Factor ratings between raters and additional raters in more than 93% of all reports. Over 92% of the reports reflected complete agreement between the raters and reviewers. Over 98% of all reports reflect complete agreement between additional raters and reviewers. The stability of Performance Factor mean values across categories of rating officials and the extremely high correlation coefficients between each pair of types of rating officials for each Performance Factor are further evidence of the extent of agreement. As might be expected, there is slightly greater agreement betweeen additional raters and reviewers than between raters and additional raters. Agreement between raters and reviewers, although high, is slightly below the level of agreement between raters and additional raters.

Intercorrelations among Performance Factor ratings are all positive and of moderate degree.

Equal Opportunity Participation is, in general, less highly correlated with the remaining factors than is any other single factor.

Performance Factors taken in combination correlate more highly with Evaluation of Potential ratings than do individual Performance Factors. Although raters' Performance Factor ratings in combination account for approximately 45% of the variability in raters' Evaluation of Potential, the percent of variance accounted for is reduced to 30% for additional raters' Evaluation of Potential and to 24% for reviewers' Evaluation of Potential. No single Performance Factor makes an appreciable independent contribution to these levels of predictive efficiency. The statistical analysis of the data indicates that one or more of the Performance Factors could be deleted from the Form 707 without affecting the manner in which the rating official evaluates the ratee's potential. Comparisons involving the independent contribution of each of the Performance Factors indicate that it would make very little difference which Performance Factor or subset of Performance Factors are removed from consideration. Within the minor differences that do appear, the Written Communication and Job Knowledge factors make less independent contribution than do the other Performance Factors.

While raters' Performance Factors do account in some degree for reviewers' Evalution of Potential ratings, the best single predictor of reviewers' Evaluation of Potential is the additional raters' Evaluation of Potential. Performance Factor ratings add essentially nothing to the predictive efficiency provided by the additional raters' Evaluation of Potential.

The above discussion pertains to lieutenant colonel reports. The use of Performance Factors and the relationship of Performance Factors for ratings of Evaluation of Potential may vary considerably as a function of the ratee's grade.

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